Investigating Children with Respiratory Allergy for Undiagnosed Rhinosinusitis

Thesis

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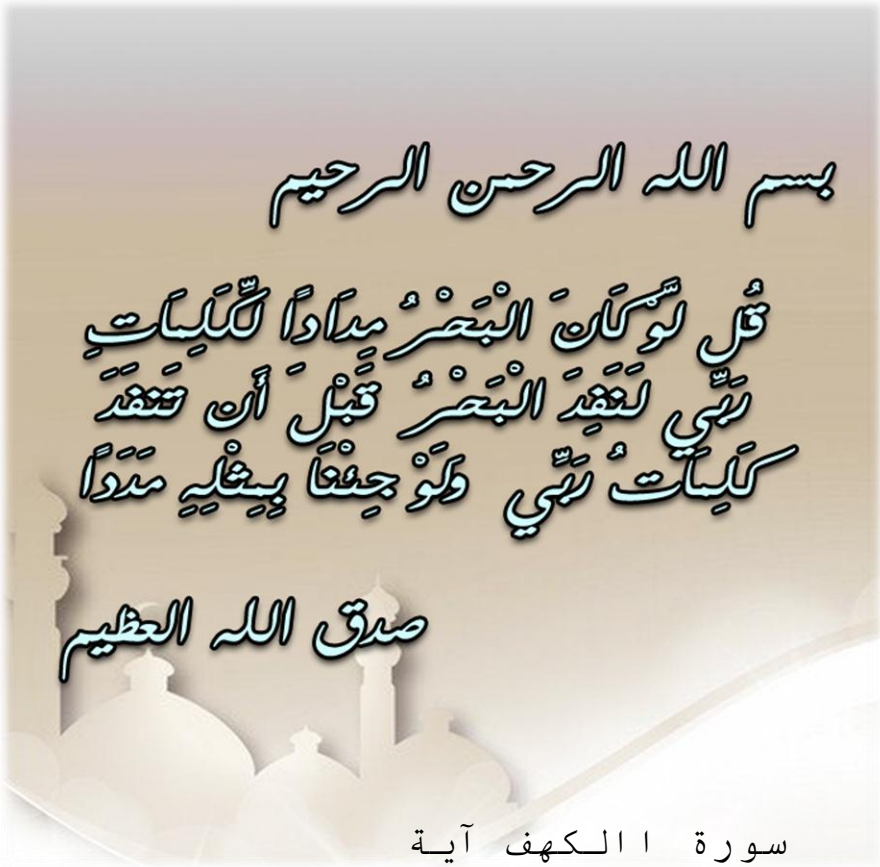

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Eman Mohammad Saeid

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List of Abbreviations

ABPA ..... Allergic bronchopulmonary Aspergillosis

ABRS ..... Acute bacterial rhinosinusitis

AECS ..... Acute exacerbation of chronic Sinusitis

AFRS ..... Allergic fungal rhinosinusitis

AIFRS ..... Acute invasive fungal rhinosinusitis

APCS ..... Antigen Presenting Cells

AR ..... Allergic Rhinitis

ARS ..... Acute rhinosinusitis

CBC ..... Complete Blood Count

CBCT ..... Cone-beam computed tomography

CF ..... Cystic Fibrosis

CHES ..... Chronic Hyperplastic Eosinophilic Sinusitis

CRP ..... C-Reactive protein

CRS ..... Chronic Rhinosinusitis

CRSsNP ..... Chronic Rhinosinusitis without Nasal Polyps

CRSwNP ..... Chronic Rhino Sinusitis with Nasal Polyps

CT ..... Computed Tomography

DMRT1 ..... Double sex and mab-3 related transcription factor 1

List of Abbreviations

EAACI ..... European Academy of Allergy and Clinical Immunology

EIA ..... Enzyme Immno assay

EPOS ..... European position paper on rhinosinusitis and nasal polyps guidelines

ESR ..... Erythrocyte sedimentation rate

FESS ..... Functional endoscopic sinus surgery

FEV ..... Forced expiratory volume

GE ..... General Electric

GER ..... Gastro esophygeal reflux

IDSA ..... Infectious diseases society of America

IgE ..... Immunoglobulin E

IL-5 ..... Interleukin 5

ILC ..... Innate Lymphoid Cells

INA ..... intranasal inferior meatal antrostomy

INCs ..... Intranasal corticosteroid

ISAAC ..... International study of asthma and allergy in childhood

IT ..... Immunotherapy

LTRAs ..... Leukotriene receptor antagonists

MAST ..... Multipe Allergen Simultaneous Tests

MF ..... Mometasone Furoate

MHC ..... Major histocompatability complex

List of Abbreviations

MRI ..... Magnetic Resonance Imaging

NPs ..... Nasal Polyps

OCS ..... Oral corticosteroids

OMC ..... Osteo- meatal complex

PEF ..... Peak expiratory flow

RARS ..... Recurrent acute rhinosinusitis

RAST ..... Radio Allergo Sorbent Test

RP ..... Rhinopharynx

RS ..... Rhinosinusitis

SER ..... Spheno-ethmoidalrecess

SLIT ..... Sublingual immuno-therapy

SLIT ..... Sublingual immune-therapy

SNI ..... Saline Nasal Irrigation

SPT ..... Skin Prick Test

URT ..... Upper Respiratory Tract

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Introduction

Paranasal sinuses are empty spaces located within the skull bones around the nasal cavity ***(Korkmaz and Korkmaz, 2013).*** The paranasal sinuses, along with the turbinates, facilitate the function of the nasal space in the warming and humidification of air and contribute to the body's defences against microbial ingress ***(Bell et al., 2011).***

Rhinitis and sinusitis are among the most common medical conditions and are frequently associated. Both rhinitis and sinusitis can significantly decrease quality of life, aggravate comorbid conditions, and require significant direct medical expenditures. Both conditions also create even greater indirect costs to society by causing lost school days and reduced learning capacity ***(Passali et al., 2015).***

Rhinosinusitis (RS) clinical diagnosis in children is challenging, due to the overlapping of symptoms with other ordinary childhood nasal diseases, such as viral upper respiratory tract infections and allergic rhinitis ***(Fokkens et al., 2012).*** Allergic rhinitis is the most common type of chronic rhinitis, affecting 10 to 20% of the population. Severe allergic rhinitis is associated with significant impairments in quality of life, sleep and school performance ***(Dykewicz and Hamilos, 2010).***

The link between asthma, allergic rhinitis and rhinosinusitis is well known and internationally accepted, while the precise concept of a united airways disease has been postulated ***(Passalacqua et al., 2001).*** The therapeutic approach should focus not only on the control of the united airways disease to avoid respiratory complications, but also to provide a better quality of life in patients and to let them be comparable to the general population in everyday settings ***(Caimmi et al., 2012)***.

Aim of the Work

This study is aimed to investigate a group of atopic children with physician-diagnosed allergic rhinitis for the presence of documented sinusitis. The ultimate objective is to provide adequate therapy and reduce morbidity.

Review of Literature

Paranasal sinuses are air-filled hollows in the skull bones connected to the nose. They humidify, filter, warm, and sense what we breathe. Their anatomy and physiology interact forming a dynamic system ***(Jones, 2001).***

The **major paranasal sinuses** are: *Maxillary sinus*- one sinus located within the bone of each cheek. *Ethmoid sinus*- located under the bone of the inside corner of each eye, although this is often shown as a single sinus, this is really a honeycomb-like structure of 6-12 small sinuses. *Frontal*- one sinus per side, located within the bone of the forehead above the level of the eyes and nasal bridge. *Sphenoid*- one sinus per side, located behind the ethmoid sinuses; the sphenoid is not seen in a head-on view but is better appreciated looking at a side view **(**figure1**)** ***(Chandra and Patel, 2015).***

Typically the etmoidal and maxillary sinuses are present at birth, but only the ethmoidal sinuses are pneumatized. The maxillary sinuses are not pneumatized until 4 year of age. The sphenoidal sinuses are present by 5 year of age, whereas the frontal sinuses begin development at age 7-8 year and are not completely developed until adolescence ***(Pappas et al., 2016)***

Anatomy and development of the sinuses

The **maxillary sinus** resembles a four-sided pyramid. The base lies vertically on the medial surface and forms the lateral nasal wall. The apex extends laterally into the zygomatic process of the maxilla. The roof of the sinus is also the floor of the orbit. The posterior wall extends the length of the maxilla **(figure 2) (*Ahmed, 2013).***

Developmentally, it is the first sinus to develop and is filled with fluid at birth. It grows according to a biphasic pattern, in which the first phase occurs during years 0-3 and the second during years 6-12 ***(Dalgorf and Harvey, 2013) ; figure 1.***

The frontal sinus is housed in the frontal bone superior to the eyes in the forehead. It is formed by the upward movement of anterior ethmoid cells after the age of 2 years. The frontal sinuses are funnel-shaped structures with their ostia located in the most dependent portion of the cavities. The posterior wall of the frontal sinus, which separates the sinus from the anterior cranial fossa, is much thinner than its anterior wall ***(Wormald, 2005).*** Developmentally, this is the last sinus to pneumatize. The frontal sinus is formed by pneumatization of the frontal recess into the frontal bone. Growth increases at age 6 years and continues until the late teenage years. The frontal sinuses are funnel-shaped structures with their ostia located in the most dependent portion of the cavities ***(Ahmed, 2013).***

Frontal and/or maxillary sinusitis frequently originates with pathologic processes of the ethmoid sinuses. This clinical association is explained by the close anatomical relationship between the frontal and maxillary sinuses and the ethmoid sinus, since developmental trajectories place the ethmoid in a strategic central position within the nasal complex ***(Márquez et al., 2008).***

The ethmoid sinuses arise in the ethmoid bone, forming several distinct air cells between the eyes. They are a collection of fluid-filled cells at birth that grow and pneumatize until the age of 12 years. The ethmoid cells are shaped like pyramids and are divided by thin septa. They are bordered by the middle turbinate medially and the medial orbital wall laterally. The ethmoid labyrinth may extend above the orbit, lateral and superior to the sphenoid, above the frontal sinus, and into the roof of the maxillary sinus ***(Scuderi et al., 1993).*** In some situations, the ethmoid cells might pneumatize into the head of the middle turbinate (a variation known as concha bullosa) and extreme middle turbinate aeration; greatly enlarging the turbinate might narrow the ostiomeatal complex enough to predispose toward rhinosinusitis. The location of the anterior ethmoid sinuses and middle meatus makes the ostiomeatal complex particularly at risk from environmental exposures, and this region is typically the first and the most frequently involved region in chronic rhinosinusitis ***(Yousem et al., 1991).***